DOCUMENT RESUME

ED 037 249 PS 003 000

AUTHOR	Manning, Brad A.; And Others
TITLE	A Replication and Extension Study on N-Length, Inhibition and Cooperative Behavior with a Mexican-American Population. Part of the Final Report on Head Start Evaluation and Research: 1968-69 to the Office of Economic Opportunity.
INSTITUTION	Texas Univ., Austin. Child Development Evaluation and Research Center.
SPONS AGENCY	Office of Economic Opportunity, Washington, D.C.
REPORT NO	OEO-4115
PUB DATE	Aug 69
NOTE	28p.
EDRS PRICE	EDRS Price MF-$0.25 HC-$1.50
DESCRIPTORS	*Behavior Patterns, Cultural Factors, Extinction (Psychology), Mexican Americans, *Preschool Children, *Psychological Studies, Reinforcement
IDENTIFIERS	Cooperative Behavior

ABSTRACT

A study of cooperative behavior (social learning) and N-lengths using Negro subjects was replicated and extended. Subjects were 100 Mexican-American children, 4 1/2 to 6 years old. N-length was defined as the number of nonreinforced trials spaced between reinforced trials and intertrial reinforcement (ITR), introduced between regularly scheduled trials. The experimental situation was a two-person, two-choice game in which each subject had control over the other player's gain and could choose either to cooperate or not to cooperate. The experiment consisted of two phases: the acquisition phase (def ned as the first 30 cooperative responses), and the 30 trial extinction phase. The subjects were divided into five groups of 20 each. The first four groups received 50% partial reinforcement for the first 30 responses and ITR in N-lengths of 1, 2, 3, and four. The fifth group received continuous or 100% reinforcement. The findings matched those of the previous study in that the 100% group was least resistant to extinction and the N1-length group was most resistant to extinction. However, in contrast to the Negro study, in the present study N-length groups did not differ in acquisition and increased their cooperation as a function of trials. (MH)

PART OF THE FINAL REPORT

ON

HEAD START EVALUATION AND RESEARCH: 1968-69

TO

THE OFFICE OF ECONOMIC OPPORTUNITY
(Contract No. OEO-4115)

CHILD DEVELOPMENT EVALUATION AND RESEARCH CENTER

John Pierce-Jones, Ph.D., Director

The University of Texas at Austin

August, 1969

A REPLICATION AND EXTENSION STUDY ON N-LENGTH, INHIBITION AND COOPERATIVE BEHAVIOR WITH A MEXICAN-AMERICAN POPULATION

Brad A. Manning
John Pierce-Jones
Donna M. Buntaine

This study was supported by Contract No. OEO-4115 between the Office of Economic Opportunity, Project Head Start, and The University of Texas at Austin.

A Replication and Extension Study on N-length, Inhibition and Cooperative Behavior with a Mexican-American Population

Brad A. Manning

John Pierce-Jones

Donna M. Buntaine

The University of Texas at Austin

This study was devoted to the replication and extension of a previous study concerning N-length (Manning and Pierce-Jones, 1969). The previous study used a Negro population, while the present study used a Mexican-American population. N-length was defined as the number of nonreinforced trials spaced between reinforced trials and intertrial reinforcement (Capaldi, 1964). An intertrial reinforcement (ITR) was defined as a reinforcement introduced between regularly scheduled trials of reinforcement and nonreinforcement (Capaldi, Hart and Stanley, 1963).

N-length and ITR were first developed and used with rats in an instrumental learning, straight alley runway situation. The Manning and Pierce-Jones (1969) study extended the use of N-length and ITR to a two-person, two-choice social learning situation. This extension was done by giving constant nonreinforcement to one lever-pulling response which was defined as a noncooperative response and

50% reinforcement with varied N-length to another lever-pulling response which was defined as the cooperative response. The partial reinforcement effect was shown in this study with the 100% reinforcement group being less resistant to extinction than three other groups receiving 50% reinforcement with varying N-lengths. The N_1-length group was the most resistant to extinction which is the reverse of the findings made in studies using rats and straight alley runways. The N_2-length and N_3-length groups made about the same mean number of cooperative responses per block of five trials in extinction. At this time it was hypothesized that N-lengths beyond one were operating in a manner which inhibited a cooperative response being conditioned since it seemed plausible that subjects in such groups more readily realized that the cooperation was not reciprocated.

Another major finding in the Manning and Pierce-Jones (1969) study was that the N_2-length group and the 100% reinforcement group significantly dropped in their rate of cooperation from acquisition to extinction. In contrast, the N_1-length group maintained a comparatively high rate of cooperation from acquisition to extinction and the N_3-length group maintained a comparatively low rate of cooperation.

In adult game theory studies in which the subjects are allowed to respond freely without an experimenter manipulating the outcome of the choices, the subjects will usually compete more as a function of trials. They will also make more predictions of competitive choices from the other player as the experiment progresses

(Manning, 1965). Since adult subjects predicted less cooperation as competitiveness increased, it appears that this realization of the degree to which cooperative efforts are being reciprocated is directly related to the amount of cooperative behavior in which the experimental subject wishes to engage. In the present study it was hypothesized that if N-length were extended to four that an even lesser degree of cooperative behavior would result, due to the increased amount of inhibition that would develop. In other words, the subjects would more readily realize that cooperation was not being reciprocated and would respond in a noncooperative manner.

It was also noted in the Manning, Pierce-Jones (1969) experiment that the Negro population cooperated at quite a high level. It seemed reasonable to assume that there might be ethnic group differences in this type of behavior. A study exploring such ethnic group differences (Manning, Pierce-Jones and Parelman, 1968) found that Anglo females responded differently than did females of other ethnic groups. However, it was felt that since this study was a more traditional game theory experiment and did not have an extinction phase some ethnic group differences may have been missed. Also, both cooperative and noncooperative responses were reinforced, but cooperative responses were given twice the magnitude of reward. This type of reinforcement schedule may have masked existing ethnic group differences in cooperative behavior. It was then decided that the Manning and Pierce-Jones (1969) N-length study should be replicated on the next most frequent

ethnic group in the southwest, Mexican-Americans, while adding an N-length group of four to test the limits of N-length relationships. In this way, both the stability of effects of N-length on cooperation and the ethnic group differences could be tested.

On the basis of the results of the literature discussed above the following hypotheses were made:

Hypotheses

Hypothesis I: Negro subjects will differ from Mexican-American subjects in their cooperative behavior.

Hypothesis II: Subjects given an N-length of one for cooperative responses during acquisition will be the most resistant to extinction.

Hypothesis III: Subjects given N-lengths of two and three for cooperative responses during acquisition will be more resistant to extinction than subjects given an N-length of four or continuous reinforcement but less resistant to extinction than subjects given an N-length of one.

Hypothesis IV: Subjects given an N-length of four for cooperative responses during acquisition will be more resistant to extinction than subjects given continuous reinforcement but less resistant to extinction than subjects given N-lengths of one, two or three.

Hypothesis V: Subjects given continuous reinforcement for cooperative responses during acquisition will be the least resistant to extinction.

Hypothesis VI: The N_2-length and 100% reward groups will decline in their rate of cooperation from acquisition to extinction, while the N_1-length group will maintain a comparatively high rate of cooperation and the N_3-length will maintain a comparatively low rate of cooperation.

Method

Subjects

The subjects consisted of 100 Mexican-American four and one-half, five and six year old males from a culturally deprived population from the Houston Texas Day Care Centers and the Del Rio Head Start Centers. These subjects were divided into five equal groups of 20 each. Four of the groups were each given a different N-length in the acquisition phase of the experiment, while the fifth group was given continuous reinforcement.

Experimental Groups

As indicated above, the treatment effect used was the variation of N-length defined as:

> ...the number of nonreinforced (N) trials which occur in succession without interruption by a reinforced (R) trial. (Capaldi, 1964, p. 230)

There were five groups which were given the following treatments in the

acquisition phase of the experiment: 1) Group I received an N-length of one; 2) Group II received an N-length of two; 3) Group III received an N-length of three; 4) Group IV received an N-length of four; and 5) Group V received continuous reinforcement.

Game Model

The game used in this study was the type of game referred to by Wilson and Bixenstine (1962) as "absolute control over other's gain." In this type of game each player has control over the other player's gains but not over his own personal gains. If both players choose to make cooperative responses, they will maximize their incentive gain, but will minimize their gain if they make noncooperative responses. The game matrix that was used has the same basic relationships as has the one illustrated by Wilson and Bixenstine, but the absolute values are changed. The game matrix that was used in the present study is presented below:

		Column A	Column B
Row	A	1,1	0,1
	B	1,0	0,0

In the above matrix, if the row player chooses an (A) (cooperative) strategy and the column player chooses an (A) strategy, each will receive an incentive gain of one. If the row player chooses a (B) (noncooperative) strategy and the column player chooses an (A)

strategy, the row player will receive an incentive gain of one and the column player will receive an incentive gain of zero. If the row player chooses an (A) strategy and the column player chooses a (B) strategy, the row player will receive an incentive gain of zero and the column player will receive an incentive gain of one. If both row and column players choose a strategy of (B), they will both receive an incentive gain of zero.

The set of relationships described above, though essentially quite simple, would be far too complex for the sample used in this study to grasp. The subjects used in this study were instead told that they had two choices. The subjects were told that they could pull one lever marked with an (X) and give their game partner a piece of candy or they could pull an unmarked lever and not give their partner any candy. These choices were respectively designated as cooperative or noncooperative. After both subjects had made their choices on any one trial they each received any one of the four possible combinations of scores. (In studies using adults, the subjects' choices are usually made simultaneously.) Of course, the actual outcome of any one trial was dependent upon the predetermined reinforcement schedule which will be described in the next section.

Reinforcement Schedule

Fifty percent partial reinforcement was given to Groups I, II, III, and IV for the first 30 responses made on the cooperative lever of the game board. Group IV was given 10 extra trials in acquisition

so that they would receive five conditionings of their assigned N-length (N_4-length). The other N-length groups received five conditionings of their assigned N-length as well. It was decided not to extend the trials for the other N-length groups in order to be able to make these groups directly comparable to the groups in the Manning and Pierce-Jones (1969) study. After this point in the experiment each subject was switched individually to the extinction phase of the experiment (whenever they had made a cooperative response 30 times). The subjects were all given at least 30 extinction trials in which reinforcement was completely terminated for the cooperative response. The noncooperative lever pulling was never reinforced, neither in acquisition or extinction. The continuously-reinforced group (Group V) received 100% reinforcement for the first 30 responses made on the cooperative lever, followed by termination of reinforcement in the extinction phase.

All five groups received five intertrial reinforcements (ITR) during the first 30 responses on the cooperation lever (during the first 40 responses for Group IV). Groups I, II, III, and IV received an equal number of reinforcements and nonreinforcements for the acquisition phase. The actual reward schedule given for cooperative responses appears below:

Group I:	R N N X N R R R R N N X N R R N N X N R R R R N N X N R R N N X N R R
Group II:	R N X N N R R R R N X N N R R N X N N R R R R N X N N R R N X N N R R
Group III:	R X N N N R R R X R N N N R R X N N N R R R X R N N N R R X N N N R R
Group IV:	R R X N N N N R R R X R N N N N R R R R X N N N N R R R X R N N N N R R R X N N N N R R R
Group V:	R X R R R R R R X R R R R R R X R R R R R R X R R R R R R X R R R R R

Symbols: R = reinforcement; N = nonreinforcement; X = intertrial reinforcement

Procedure

All subjects were run in pairs for two experimental sessions. In order to avoid fatiguing the children, an experimental session was not continued for more than an hour. The acquisition phase ranged from 45 minutes to an hour and the extinction phase was approximately 30 minutes in duration. The period of time between the acquisition and extinction phases was never greater than an hour. For subjects who cooperated early in the first session, but had a partner who did not, an extended period of extinction trials was used. This extended period of extinction was necessary in order to keep the game going. However, only the first 30 extinction trials for each subject were used in the data analysis.

After the subjects had been brought into the experimental room, they were seated side by side in front of one of the two game boards (described in the apparatus section). An Anglo female experimenter explained to them in Spanish or English that they were going to take part in a game with each other in which they would have a chance to get some candy. The experimenter then proceeded to explain the game to the subjects. In brief, they were told that they would be given two choices on each of a number of turns that they would be taking throughout the game. One subject would have to wait while the other subject took his turn. The two choices were: 1) the subject could decide to pull a lever which would give the other subject a piece of candy (cooperative behavior), or 2) the subject could decide to pull

another lever which would not give the other subject any candy (non-cooperative behavior). It was made clear to the children that they could keep the other subject from getting any candy, but that he might do the same thing to them. It was also made clear to the subjects that they were not to be allowed to talk or ask questions once the game had started. The subjects were then questioned in detail to make sure that they understood the game and the restriction of not talking during the game.

The total number of trials in the acquisition phase of the experiment was dependent upon the number of trials it took each subject to make 30 cooperative responses (or in the case of the N_4-length group a minimum of 40 trials) before he could be switched to the extinction phase of the experiment, which was a minimum of 30 trials. Since a second experimenter controlled the entire reinforcement schedule, the information received by the subjects about each other's choices was controlled as well.

In order to ensure that the children understood the game, the difference between their two choices, and the meaning of their choices, the female experimenter spent at least one-third of the experimental time coaching subjects. The actual coaching of the subjects included both verbal instruction and four practice trials. During the practice trials the subjects were allowed to inspect each other's reward trays in order to reassure themselves that the game boards actually worked. Throughout the experimental sessions the first experimenter commented

to each subject separately, on the outcome of the other subject's choice; i.e., "he gave you a piece of candy, didn't he?"

Apparatus

The subjects were run with a portable apparatus developed and used in the Manning, Pierce-Jones, and Parelman (1969) study. The apparatus consisted of two subject game boards and two experimenter miniboxes. The subjects were seated at opposite ends of a table, one on each side of the experimenters, and separated from them by partitions. The two experimenters sat across the table from each other. One experimenter called out the subjects' names when it was their turn and recorded their responses. The other experimenter administered the rewards.

Each subject's game board contained two levers which, when pulled, both activated a bell (in order to make the experiment more realistic and communicate to the subject that he had done something to the environment by pulling the lever) and turned on a light on the experimenter's panel, informing the experimenter of the subject's choice. The levers on the subjects' panels represented the two choices possible in the game. The experimenter's miniboxes (one for each subject) each contained two lights which informed the experimenter of any one subject's choice for a given trial.

The panels that separated the two subjects from the experimenter each contained a small hole so that the experimenter could quietly slip the reward to each subject through an inclined aluminum tube. Recorded music was used as a masking noise to drown out the noise of

the reward being given and to avoid having the subjects suspect that the other subject was being rewarded at any time other than when his "partner" in the game chose to cooperate with him.

M&M candies were used for reinforcement and were administered through inclined aluminum tubes into padded aluminum trays in order to decrease the noise of the reward administration. Intertrial reward was administered by announcing to the subjects that they were going to take a "quick rest period" and not to pull the levers until called again. The subject who was due for intertrial reward was then told that he could have a "free" piece of candy during this "quick rest period" and the intertrial reinforcement was placed in the reward tube and administered in the usual way. The difference, of course, between an intertrial reinforcement (ITR) and a regular reinforcement was that the subject made no effort to receive the ITR but did make an effort (pulling a lever) when receiving a regular reinforcement. After a child received a piece of candy he was asked to place it in a "bank-like" box so that he would not be able to see the accumulated reward as the experiment progressed.

Results

Acquisition

The dependent variable used in this study was the number of cooperative responses made by each subject. The first data analysis made was a 5 X 6 analysis of variance with both between and within

dimensions. The between dimensions were the five levels of N-length grouping. The within dimensions were six blocks of five trials, which were the last 30 responses made in the acquisition phase of the experiment. As can be seen from Table 1, the groups did not significantly differ. In other words, the groups were not cooperating at different levels before the onset of the extinction phase.

The difference within groups between blocks of 5 trials with all groups combined was significant beyond the .001 probability level. As can be seen in Table 1A, the trial means were ordered as follows: 1) 4.18 (first block); 2) 4.33 (second block); 3) 4.42 (third block); 4) 4.38 (fourth block); 5) 4.53 (fifth block); and 6) 4.66 (sixth block). All groups increased their rate of cooperation as a function of trials (see Figure 1). However, there was no group by trials interaction.

Extinction

The second data analysis made was also a 5 X 6 analysis of variance with both between and within dimensions. The between dimensions were the five levels of N-length grouping. The within deminsions were six blocks of five trials, which were the first 30 trials in the extinction phase of the experiment. As can be seen from Table 2 the difference between groups was significant beyond the .01 probability level. As Table 2A indicates, group mean scores were ordered as follows: 1) N_1-length (4.57); 2) N_3-length (4.12); 3) N_4-length (3.98); 4) N_2-length (3.83); 5) 100% reinforcement (3.43). It can therefore be concluded that N-length was a real source of variation in the extinction phase. The

TABLE 1

Analysis of Variance on the Acquisition Trials

Source	df	MS	F
Between	99	3.41	
N-length Groups (A)	4	4.35	1.29
Within	500	.46	
Trials (B)	5	2.74	6.43***
A X B	20	.60	1.40

***p < .001

TABLE 1A

Mean Number of Cooperative Responses

According to N-length Group and Blocks of Trials

	A_1(N_1-length)	A_2(N_2-length)	A_3(N_3-length)	A_4(N_4-length)	A_5(100% Reinf.)
Groups	4.68	4.32	4.22	4.33	4.54

	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Trials	4.18	4.33	4.42	4.38	4.53	4.66
Groups by Trials						
A_1	4.25	4.60	4.70	4.85	4.75	4.95
A_2	3.90	4.30	4.35	4.35	4.50	4.50
A_3	4.05	3.90	4.00	4.20	4.40	4.75
A_4	4.25	4.25	4.55	4.00	4.50	4.40
A_5	4.45	4.60	4.50	4.50	4.50	4.70

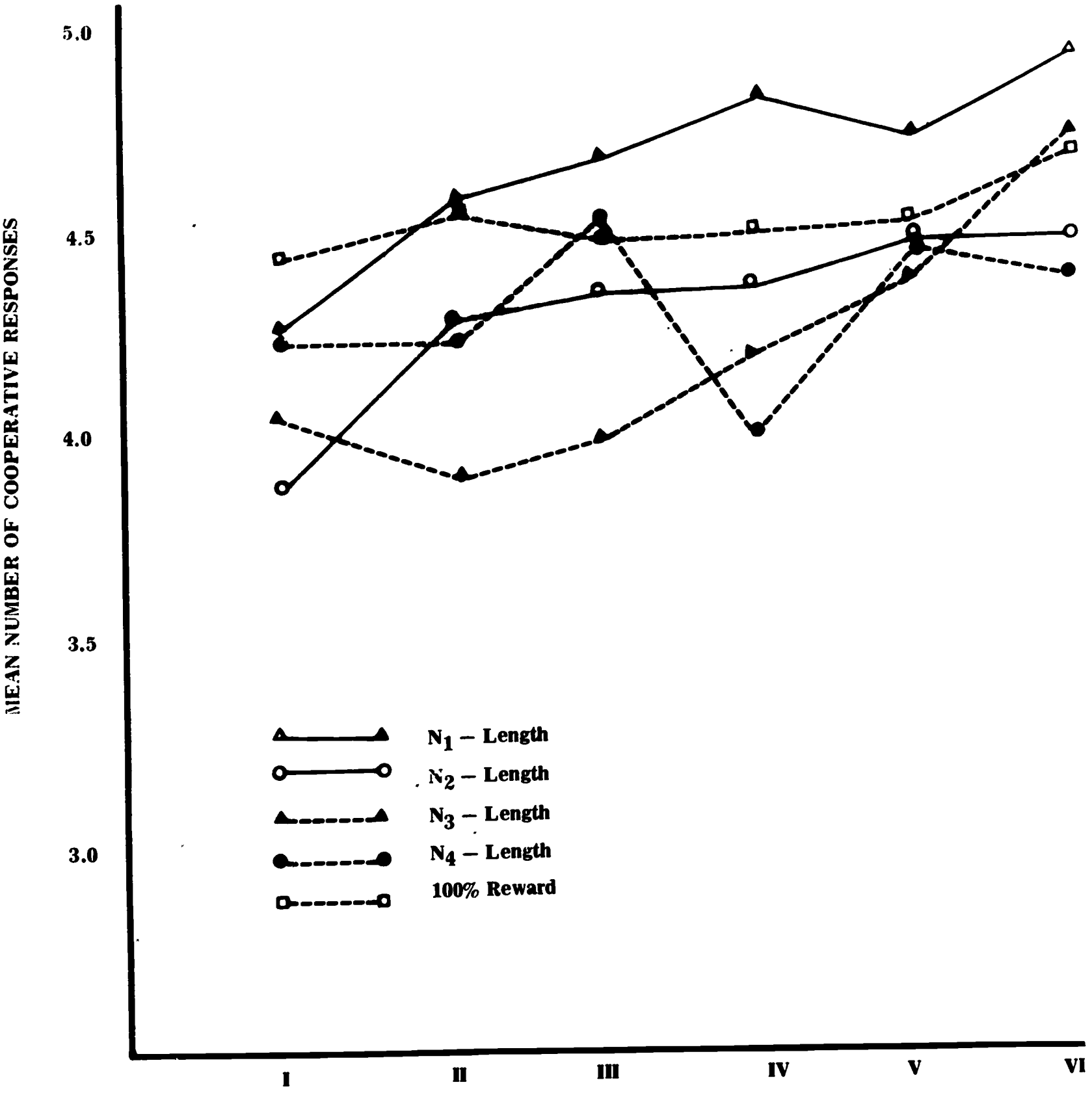

Fig. 1. Mean number of cooperative responses for each of the groups on each of the six blocks of acquisition trials.

TABLE 2

Analysis of Variance on the Extinction Trials

Source	df	MS	F
Between	99	6.63	
N-length Groups (A)	4	20.78	3.44**
Within	500	.74	
Trials (B)	5	2.25	3.13**
A X B	20	.76	1.06

**p < .01

TABLE 2A

Mean Number of Cooperative Responses

According to N-length Group and Blocks of Trials

	A_1(N_1-length)	A_2(N_2-length)	A_3(N_3-length)	A_4(N_4-length)	A_5(100% Reinf.)
Groups	4.57	3.83	4.12	3.98	3.43

	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Trials	4.21	4.12	3.98	3.92	3.89	3.81
Groups by Trials						
A_1	4.65	4.65	4.50	4.65	4.65	4.35
A_2	4.25	4.15	3.60	3.90	3.70	3.40
A_3	4.35	4.45	4.25	3.90	3.95	3.80
A_4	3.95	4.05	3.95	4.00	3.90	4.05
A_5	3.85	3.30	3.60	3.15	3.25	3.45

ordering of the group means directly supports hypothesis two, that the N-length group of one would be the most resistant to extinction. The fifth hypothesis, that subjects given continuous reinforcement for cooperative responses would be the least resistant to extinction, was also directly supported. The third hypothesis, that N-lengths of two and three would be more resistant to extinction than N-lengths of four or continuous reinforcement but less resistant to extinction than N-lengths of one, was supported by the ordering of the group means with the exception of the N_4-length group which had a higher mean score than the N_2-length group. The fourth hypothesis was supported by the ordering of the means with the exception of the N_2-length group having a lower mean value than the N_4-length group.

The within group differences between blocks of five trials for all groups combined was significant beyond the .01 probability level. The trial means were ordered as follows: 1) 4.21 (1st block); 2) 4.12 (2nd block); 3) 3.98 (3rd block); 4) 3.92 (4th block); 5) 3.89 (5th block); and 6) 3.81 (6th block). As can be seen, the mean level of cooperative responses generally decreased as a function of trials. As Table 2 indicates there was no interaction effect for groups for trials. The groups by trials performance is plotted in Figure 2.

Response Change from Acquisition to Extinction

The third data analysis made was a 5 X 2 analysis of variance with both between and within dimensions. The between dimensions were the same as those of the first two analyses with 5 levels of N-length

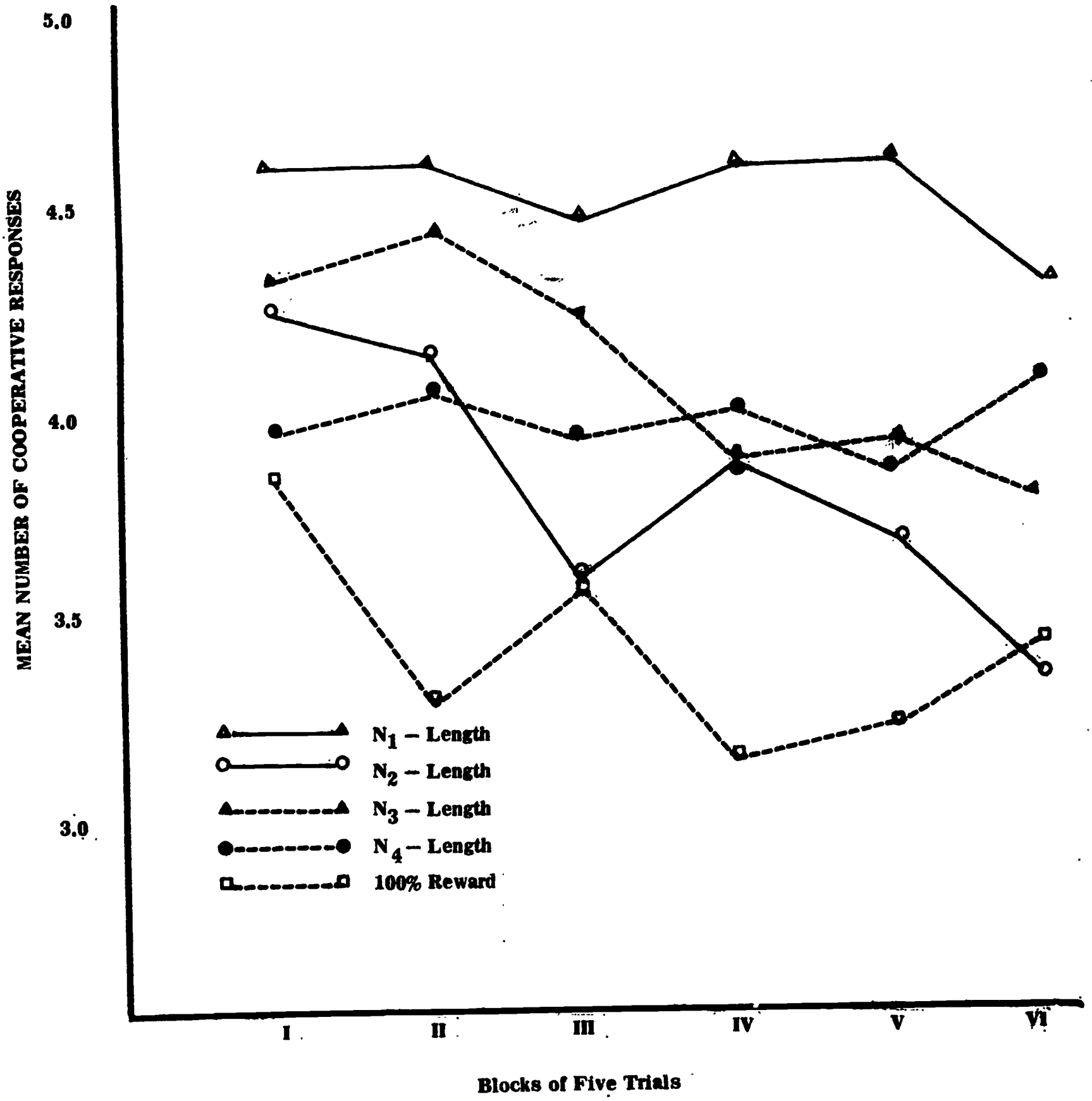

Fig. 2. Mean number of cooperative responses for each of the groups on each of the six blocks of extinction trials.

groupings. The within dimensions were the combined block trials for acquisition and the combined block trials for extinction. Table 3 indicates that the difference between groups was not significant.

The within group differences between total performance and acquisition and extinction for all groups combined was significant beyond the .001 probability level. The mean number of cooperative responses was 26.44 for the acquisition phase and 24.03 for the extinction phase.

The interaction effect for groups by trials (acquisition and extinction) was significant beyond the .01 probability level. As Figure 3 indicates the N_1-length group and the N_3-length group changed only slightly in their overall rate of cooperation from acquisition to extinction. In contrast, the 100% reward group changed from a mean number of cooperative responses of 27.25 in acquisition to a mean of 21.10 in extinction. The N_2-length group changed from a mean of 25.90 in acquisition to a mean of 23.00 in extinction. The N_4-length group changed from a mean of 25.75 in acquisition to a mean of 23.90 in extinction. This finding directly supported the sixth hypothesis.

Ethnic Group Differences in Cooperation

The fourth data analysis made was a single classification analysis of variance between the Mexican-American population of the present study and the Negro population of the Manning and Pierce-Jones 1969 study. The N_4-length group for the Mexican-Americans was not

TABLE 3

Analysis of Variance on the Acquisition and Extinction Trials

Source	df	MS	F
Between	99	47.43	
N-length Groups (A)	4	84.41	1.84
Within	100	15.87	
Trials (B)	1	290.41	25.47***
A X B	4	53.22	4.68**

**p < .01
***p < .001

TABLE 3A

Mean Number of Cooperative Responses According To

N-length Group and Acquisition and Extinction Performance

	$A_1(N_1$-length)	$A_2(N_2$-length)	$A_3(N_3$-length)	$A_4(N_4$-length)	A_5(100% Reinf.)
Groups	27.78	24.45	24.95	24.83	24.18

	Acquisition	Extinction
Trials	26.44	24.03
Groups by Trials		
A_1	28.10	27.45
A_2	25.90	23.00
A_3	25.20	24.70
A_4	25.75	23.90
A_5	27.25	21.10

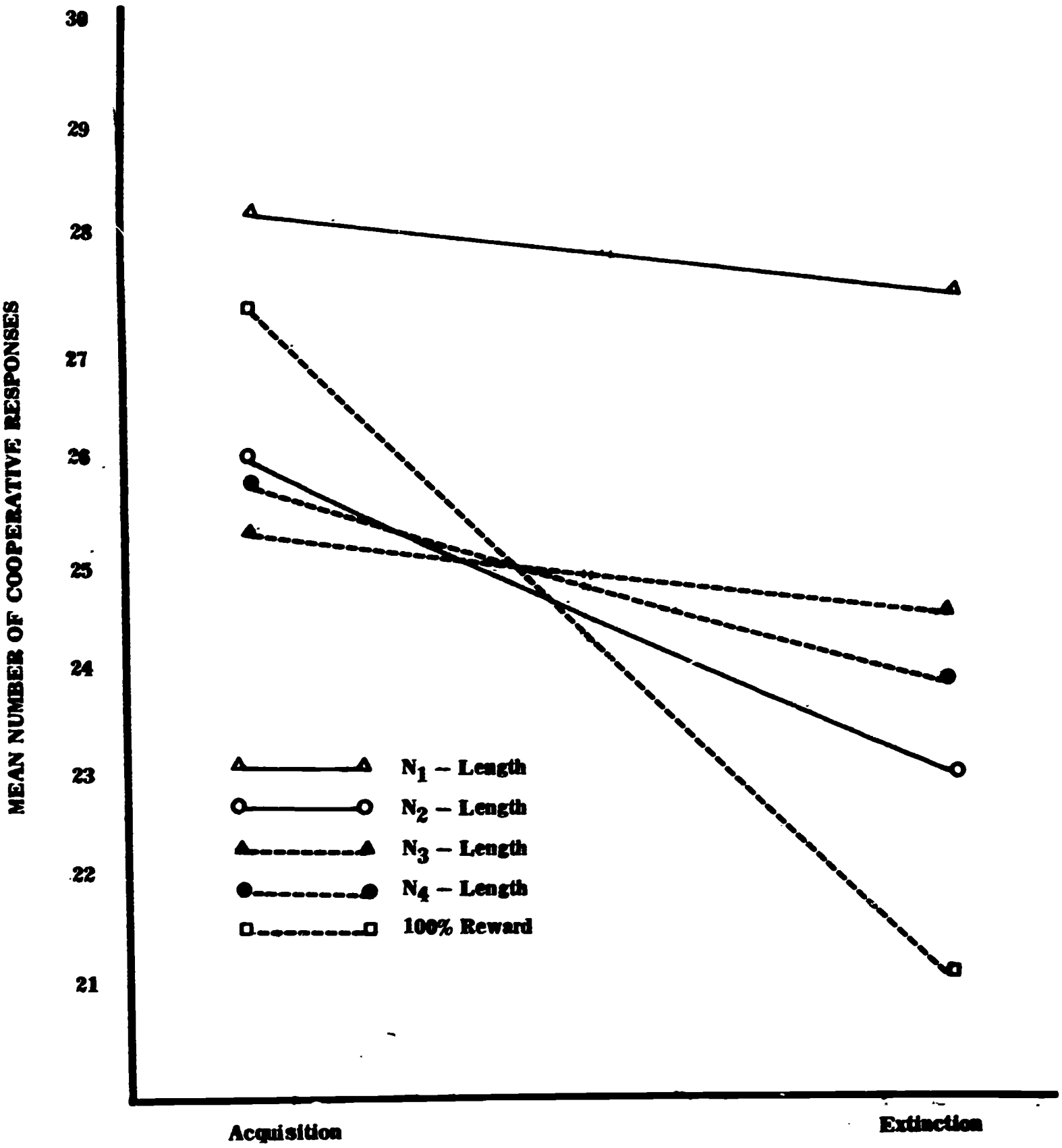

Fig. 3. Mean number of cooperative responses for each of the groups on the total acquisition and extinction trials.

included in this analysis since there was no corresponding group for the Negroes. The dependent variable was the total number of cooperative responses in the last thirty trials of acquisition. As may be seen from Table 4, the Mexican-Americans and Negroes significantly differed at the .01 probability level. This finding supports the first hypothesis that the ethnic groups would differ in their cooperative behavior. The Mexican-Americans made a mean score of 26.24 and the Negroes made a mean score of 27.85. It may then be concluded that the Negroes were a more cooperative group than the Mexican-Americans when cooperation was reciprocated at least some of the time.

The fifth data analysis was the same as the fourth data analysis, except that this analysis was made on the extinction trials. In this analysis the Mexican-Americans and the Negroes did not significantly differ in their cooperative behavior. In other words, when cooperation is not reciprocated these two ethnic groups do not differ in their cooperative behavior.

Discussion

The results of this study have first shown that the partial reinforcement effect can be replicated on different ethnic groups in a selective social learning situation. Secondly, it has been shown that N-length affects the learning of a social response in different populations.

TABLE 4

Analysis of Variance on the Acquisition Trials

for Negroes and Mexican-Americans

Source	df	MS	F
Total	159	19.11	
Ethnic Groups	1	104.01	5.60**
Error	158	18.57	

**p < .01

TABLE 4A

Analysis of Variance on the Extinction Trials

for Negroes and Mexican-Americans

Source	df	MS	F
Total	159	45.53	
Ethnic Groups	1	7.66	.167
Error	158	45.77	

There were both marked similarities and differences between the Manning and Pierce-Jones (1969) study using Negroes and the present study using Mexican-Americans. The first similarity was between the N_1-length groups and the 100% reinforcement groups. With both populations the N_1-length group was the most resistant to extinction and the 100% reinforcement group was the least resistant to extinction. The second similarity was the degree to which the N-length groups in the two populations changed in their cooperative behavior from acquisition to extinction (when the total score for each phase was considered). The N_1-length groups both maintained a high level of cooperation, while the N_3-length groups both maintained a low level of cooperation. The N_2-length groups and the 100% reinforcement groups both declined more in their rate of cooperation than did the other groups from acquisition to extinction.

The major dissimilarity between the two studies was that in the present study the N-length groups did not differ in acquisition and increased their cooperation as a function of trials; whereas, in the Manning and Pierce-Jones (1969) study, the groups did differ but did not significantly increase their rate of cooperation as a function of trials. The performance of the groups in the acquisition phase of the present study is more similar to the way rats perform in N-length experiments than the Manning and Pierce-Jones (1969) study. In other words, the groups in the present study were all cooperating at approximately the same rate at the onset of extinction and the response to be learned increased throughout the acquisition phase.

It was expected in this study that the N_4-length group would be much less resistant to extinction than the N_2 and N_3-length groups due to the inhibition that was built up in connection with the subjects' realizing to a greater extent that the cooperation was not being reciprocated. Instead, the N_4-length group had a higher mean score than the N_2-length group. Apparently the relationships between cooperative response strength and N-length are not stable beyond an N-length of one. However, it is predictable from the results of the present study and the Manning and Pierce-Jones (1969) study that an N_1-length reinforcement pattern will prove superior than N-lengths greater than one. Unfortunately, there does not seem to be a linear relationship between N-length and cooperative response strength in this particular type of experimental design. In this experimental design ten extra trials were necessary for the N_4-length group in acquisition so that they could have five conditionings of their assigned N-length as the other groups had received. The number of trials for the other groups could not be changed since this would have interferred with a direct replication of the Manning and Pierce-Jones (1969) study. These additional trials may have influenced the response strength of the N_4-length group.

Since the rate of cooperative response has been high in the extinction phase in both the study using Negroes and the study using Mexican-Americans, the extinction phase in future research should most likely be doubled. It is conjectured here that the groups may separate more as the response strength weakens with an extension of trials,

particularly, since the groups in both studies significantly decreased their cooperative responses as a function of trials in the extinction phase. If only the extinction phase is lengthened, and not the acquisition phase, the first half of the extinction phase could be used to compare the results with the Manning and Pierce-Jones (1969) study and the present study. In this way direct replications on other populations could be made at the same time that the effects of extended extinction trials on N-length were studied.

Since there was a significant difference between the Mexican-Americans and the Negroes in the acquisition phases of the two studies above, it does not seem unlikely that there would be differences in other populations. On the other hand, both of these groups were highly cooperative, and the results of the data analyses were generally the same. These findings may be related to their high level of cooperative behavior. A group which responded with a much lower level of cooperation might respond entirely differently to the N-length reinforcement schedules.

Practically, the results of both this study and the Manning and Pierce-Jones (1969) study have the same implications: that in order for children ranging from ages four and one-half through six to learn and maintain a response, this response must be rewarded or encouraged rather frequently, apart from the overall encouragement that a teacher or parent might give. Specifically, such actions as ignoring a child's efforts at cooperation and sharing one day but giving encouragement the next day should be avoided. Instead, the child should be rewarded and encouraged regularly, although not for every single effort on his part.

REFERENCES

Capaldi, E. J. Effect of N-length, number of different N-lengths, and number of reinforcements on resistance to extinction. Journal of Experimental Psychology, 1964, 68, 230-239.

Capaldi, E. J., Hart D., & Stanley, L. R. Effect of intertrial reinforcement on the aftereffect of nonreinforcement and resistance to extinction. Journal of Experimental Psychology, 1963, 65, 70-74.

Manning, B. A. Cooperative behavior as a function of attitude similarity-dissimilarity and of temptation to defect from a cooperative strategy in a two-person, mixed-motive, nonzero-sum game. Unpublished master's thesis, University of Texas, 1965.

Manning, B. A., Pierce-Jones, J., & Parelman, R. L. Cooperative, trusting behavior as a function of ethnic group similarity-dissimilarity and of immediate and delayed reward in a two-person game. Final Report to the Office of Economic Opportunity, August, 1968, Child Development Evaluation and Research Center, (Southwest), University of Texas, Contract No. OEO-4115.

Manning, B. A., & Pierce-Jones, J. The effect of N-length on the development of cooperative and non-cooperative behavior in a two-person game. Part of the Final Report to the Office of Economic Opportunity, August, 1969, Child Development Evaluation and Research Center, (Southwest), University of Texas, Contract No. OEO-4115.